802.1aq: link-state handshake for loop prevention

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Outline

- Introduction
- Link-state handshake mechanism
- Implementation possibilities in SPPBB
- Examples
- Summary

Introduction

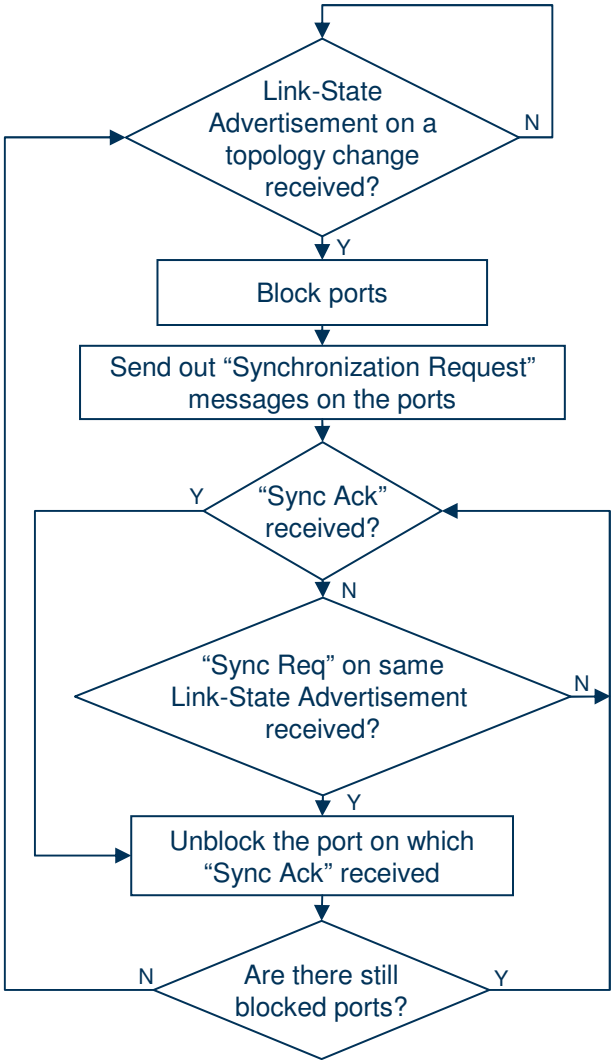
- There are no loops in stable topologies
- Loops may appear during topology transients

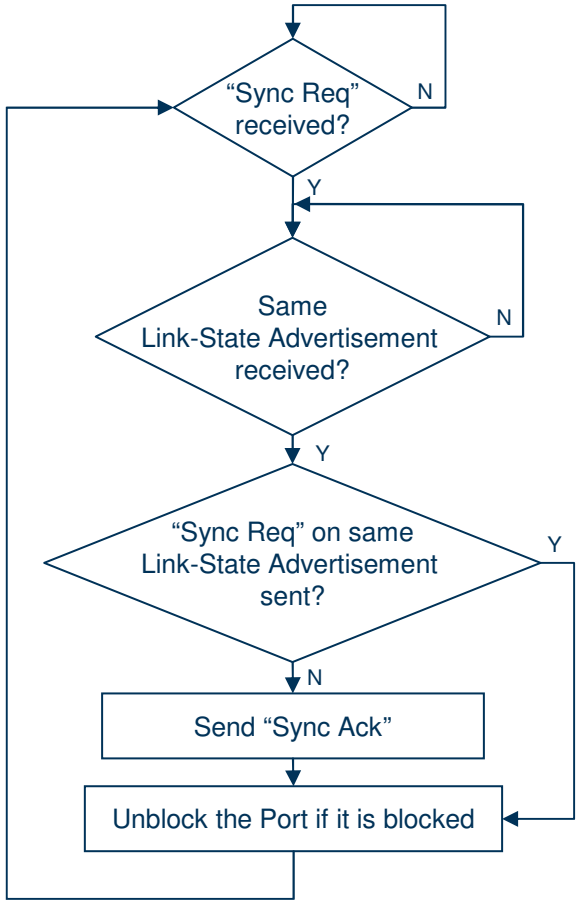
- Inconsistent view on network topology at different nodes may cause transient loops in case of a link-state control protocol

Link-state handshake mechanism

- Let's make it sure that bridges having different view on network topology do not exchange frames
- The link between adjacent neighbors has to be blocked after a topology change until they agree that both of them received the latest advertisement(s) on the change(s)
- The agreement between neighbors can be implemented in a handshake mechanism
- Agreements at different part of the network are independent of each other

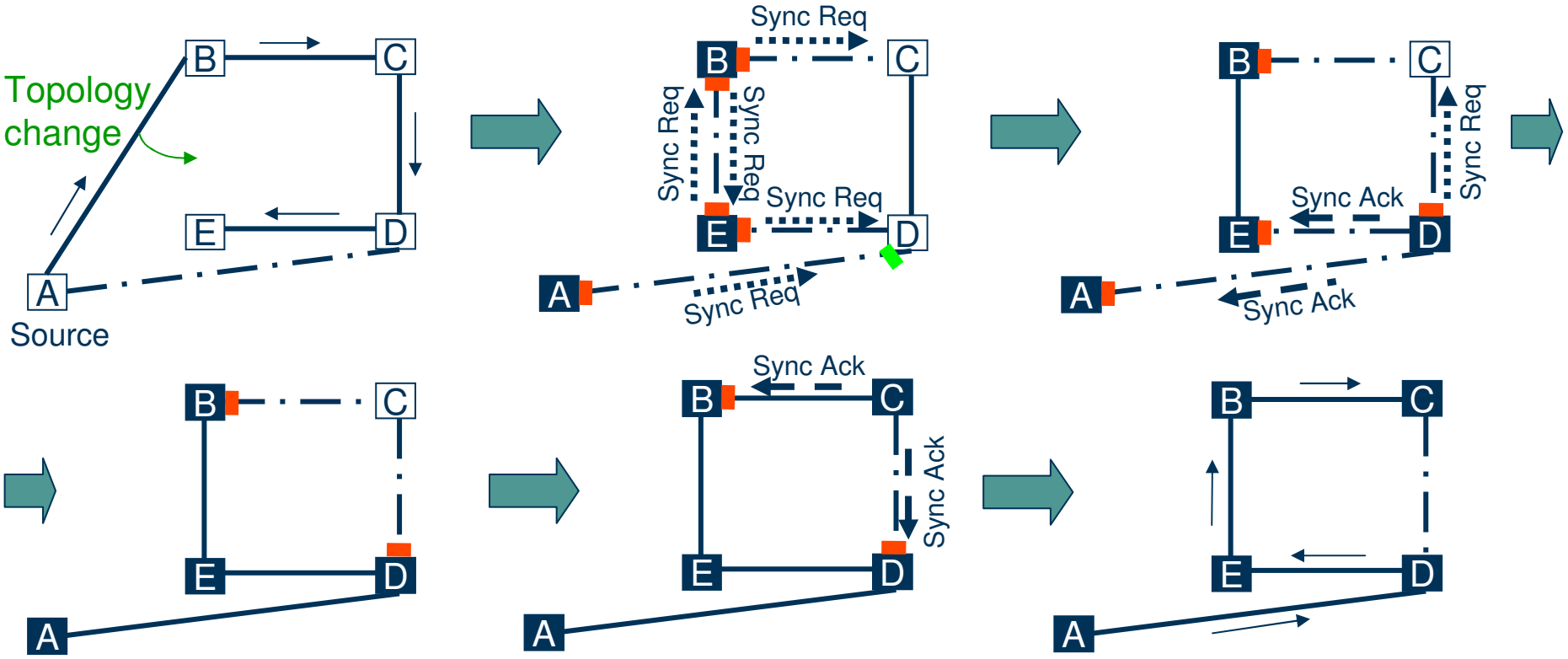
Handshake operation





Simple example

- Solves the problem identified in aq-farkas-loop-prevention-1107 and analyzed further in aq-fedyk-loop-prevention-0108



Implementation possibilities in SPPBB

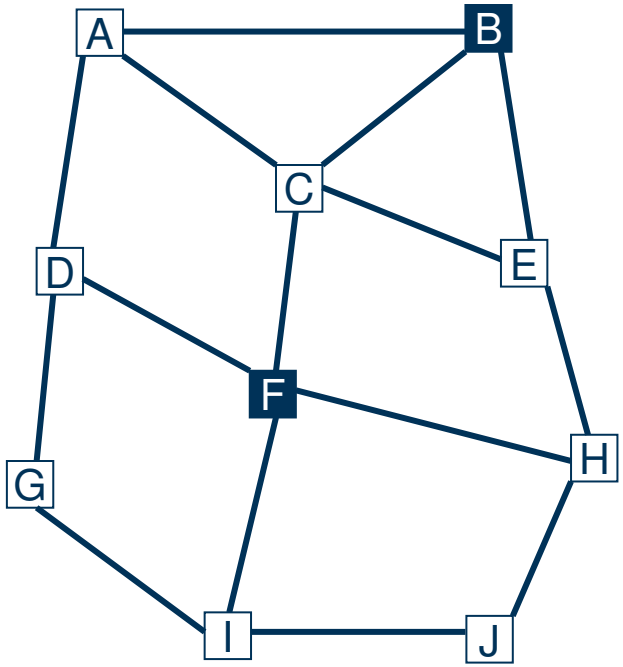
MSTP BPDU

- LSP ID and Sequence number has to be embedded
- Proposal = Synchronization Request
- Agreement = Synchronization Acknowledgement

IS-IS PDU

- LSP = Synchronization Request
- Partial Sequence Number PDU (PSNP) = Synchronization Acknowledgement
- PSNP Interval determines the convergence time: it has to be in the order of milliseconds
- New flag per port is needed to control link blocking

Generic example: B and F are notified first

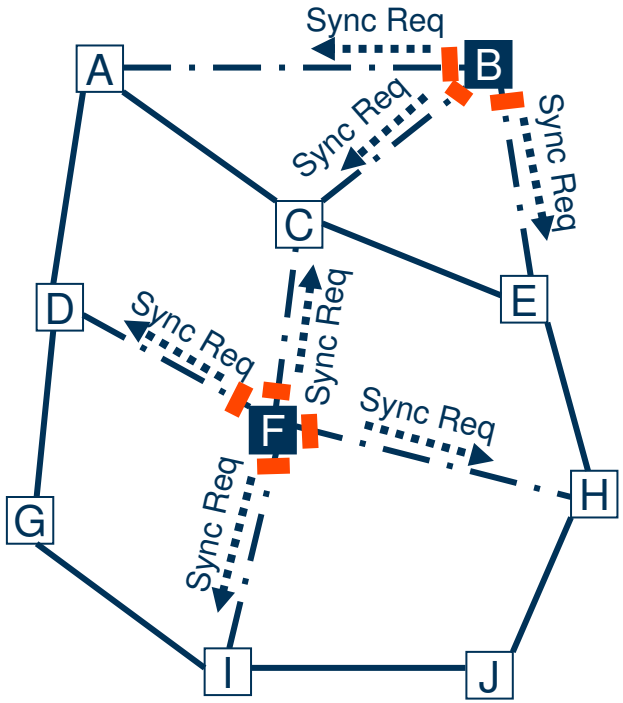


Has outdated view on the topology

Informed about topology change(s)

- Note that the order of nodes becoming aware of the change is considered as a random order

Generic example:
B and F request synchronization



Has outdated view on the topology

Informed about topology change(s)

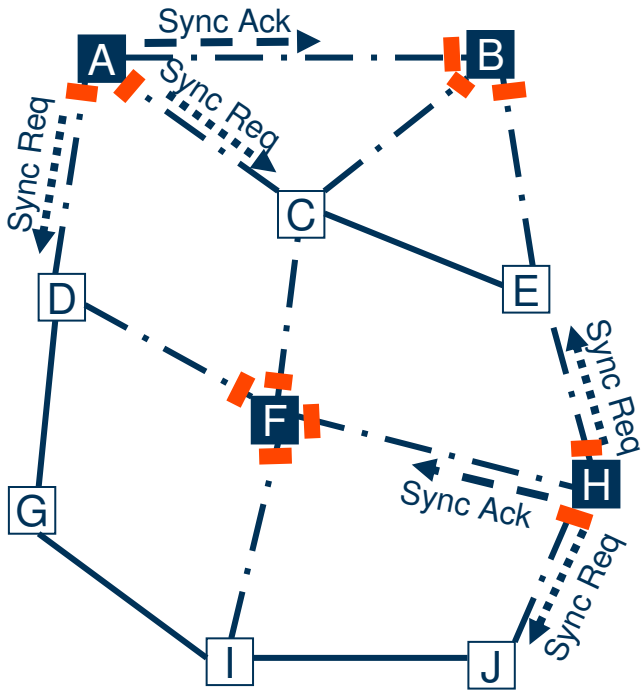
Blocking

Blocked Link

Synchronization Request

Synchronization Acknowledgement

Generic example:
A and H realized the topology change



Has outdated view on the topology

Informed about topology change(s)

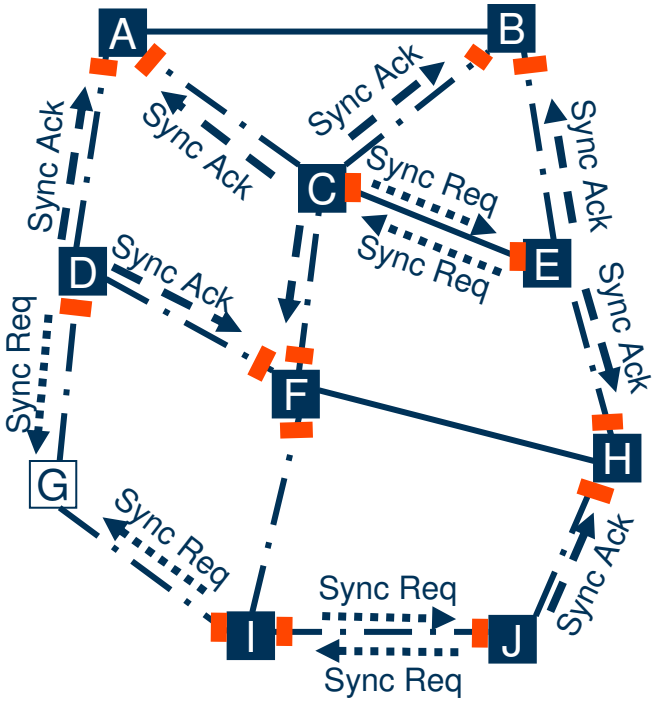
Blocking

Blocked Link

Synchronization Request

Synchronization Acknowledgement

Generic example:
C, D, E, I and J are notified too



Has outdated view on the topology

Informed about topology change(s)

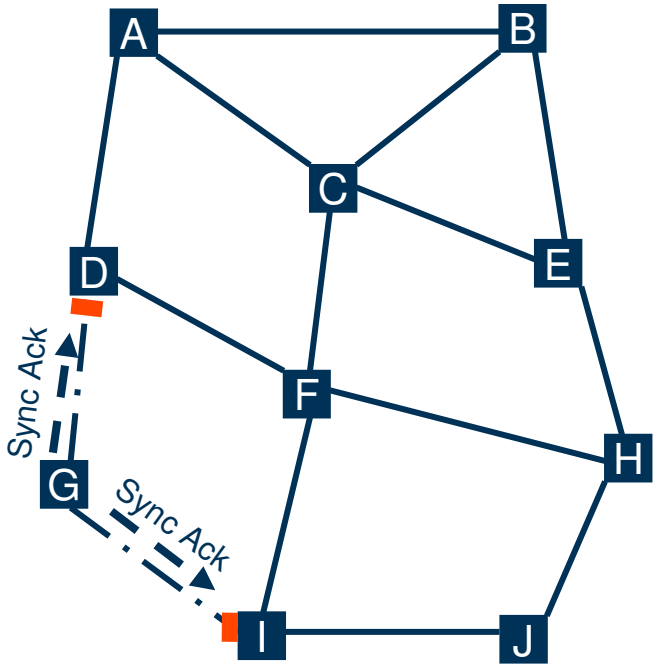
Blocking

Blocked Link

Synchronization Request

Synchronization Acknowledgement

Generic example:
G is also aware of the change



Has outdated view on the topology

Informed about topology change(s)

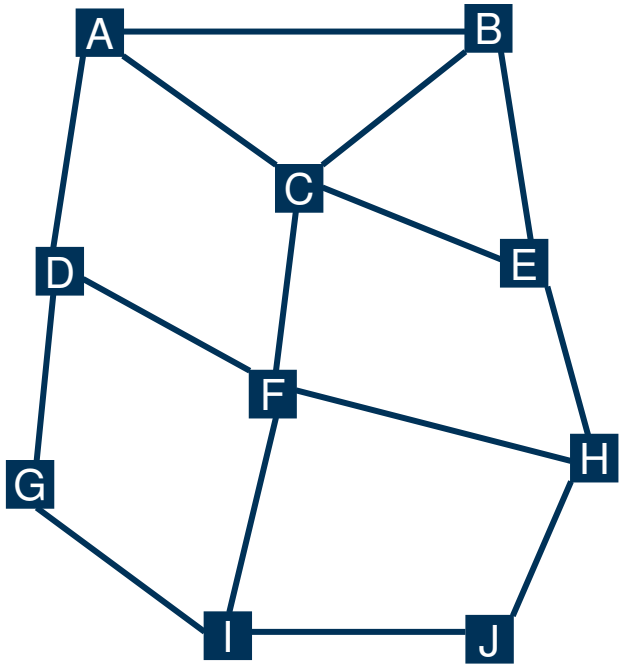
Blocking

Blocked Link

Synchronization Request

Synchronization Acknowledgement

Generic example: All nodes are updated



Has outdated view on the topology

Informed about topology change(s)

Blocking

Blocked Link

Synchronization Request

Synchronization Acknowledgement

Summary

- Transient loops may appear due to inconsistent topology view in case of a link-state control protocol
- Synchronization can be implemented by a handshake mechanism
- Neighbors have to agree on latest changes before they send frames to each other
- Thus loops are prevented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